

WHAT IS CLAIMED IS:

1                   1.       An apparatus for alerting a pilot of a rotary wing aircraft of proximity  
2 to terrain, the apparatus comprising:  
3                   an input for receiving signals representative of a position of the aircraft, a  
4 flight path angle of the aircraft and a speed of the aircraft, and coupled to a database of stored  
5 terrain information;

6                   an output;  
7                   a signal processing device, coupled to said input, and coupled to said output,

8 for:

9                   (a) defining a look ahead distance;

10                   (b) defining a first alert envelope, indicative of a first severity of terrain threat,  
11 wherein boundaries of said first alert envelope are determined as a first function of the  
12 flight path angle, said look ahead distance, and a terrain floor boundary; wherein said  
13 terrain floor boundary comprises a function of an aircraft altitude and said speed;

14                   (c) defining a second alert envelope, indicative of a second severity of terrain  
15 threat, wherein boundaries of said second alert envelope are determined as a second  
16 function of the flight path angle, said look ahead distance and said terrain floor  
17 boundary; and

18                   (d) outputting an alert signal when a subset of the stored terrain information is  
19 located within the boundaries of at least one of said first and said second alert  
20 envelopes.

1                   2.       The apparatus of claim 1 wherein at least one of said first and second  
2 alert envelopes is further bounded by a cut-off envelope.

1                   3.       The apparatus of claim 1 wherein said signals representative of the  
2 position of an aircraft include a first signal received from a satellite navigation system  
3 indicative of the aircraft altitude and a second signal representative of the aircraft altitude  
4 received from a source other than the satellite navigation system, and wherein said signal  
5 processing device further comprises a means for determining a compound altitude signal.

1                   4.       The apparatus of claim 1 wherein the boundaries of at least one of said  
2 first and second alert envelopes is further determined as a function of a configurable datum.

1                   5.       The apparatus of claim 1 wherein at least one of said first and second  
2 alert envelopes further comprises a subset of alert envelopes representing various severities of  
3 hazard to the aircraft.

1                   6.       The apparatus of claim 1 wherein said signal processing device  
2 comprises a microprocessor.

1                   7.       The apparatus of claim 1 wherein said signal processing device  
2 comprises a means for outputting said alert signal as a video control signal, wherein said  
3 video control signal is useful for controlling representation of terrain on a video display in  
4 various colors according to a degree of terrain threat.

1                   8.       The apparatus of claim 1 further comprising a voice warning generator  
2 coupled to said signal processor and wherein said alert signal output from said signal  
3 processing device comprises an audio control signal to command said voice warning  
4 generator to output an aural alert.

1                   9.       The apparatus of claim 1 wherein said speed comprises a groundspeed  
2 of the aircraft.

1                   10.      The apparatus of claim 1 wherein the aircraft is a tilt rotor.

1                   11.      The apparatus of claim 1 wherein said signal processing device further  
2 comprises a means for outputting a video control signal to control representation of a  
3 background terrain data proximate the aircraft:

4                   in a first color for terrain located more than a predetermined amount relative to  
5 a current altitude of the aircraft wherein said predetermined amount is a first value for a  
6 cruise phase of flight and a second value for an approach phase of flight and a third value for  
7 a landing phase of flight; and

8                   in a second color for terrain located less than said predetermined amount  
9 relative to said current altitude.

1                   12.      The apparatus of claim 11 wherein said cruise, approach and landing  
2 phases are defined as a function of said speed of the aircraft.

1           13.     The apparatus of claim 1 wherein said look ahead distance is a function  
2 of a distance to transition from a first phase of flight to a hover phase of flight.

1           14.     A method for alerting a pilot of a rotary wing aircraft of proximity to  
2 terrain comprising the steps of:  
3           accessing a database of terrain information;  
4           receiving signals representative of a position of the aircraft, a flight path angle  
5 of the aircraft and a speed of the aircraft;  
6           defining a look ahead distance;  
7           defining a first alert envelope, indicative of a first severity of terrain threat,  
8 wherein boundaries of said first alert envelope are determined as a first function of the flight  
9 path angle, said look ahead distance, and a terrain floor boundary;  
10          defining a second alert envelope, indicative of a second severity of terrain  
11 threat, wherein boundaries of said second alert envelope are determined as a second function  
12 of the flight path angle, said look ahead distance and said terrain floor boundary;  
13          defining said terrain floor boundary as a function of an aircraft altitude and  
14 said speed; and  
15          outputting an alert signal when a subset of the stored terrain information is  
16 located within the boundaries of at least one of said first and said second alert envelopes.

1           15.     The method of claim 14 wherein said step of outputting an alert signal  
2 further comprises the step of outputting a video control signal to control display of terrain on  
3 a display device.

1           16.     The method of claim 14 further comprising the step of defining a cut-  
2 off envelope to form a boundary of at least one of said first and second alert envelopes.

1           17.     The method of claim 14 further comprising the step of receiving a first  
2 and a second altitude signal from a distinct first and second sources respectively to obtain a  
3 compound altitude signal representative of the aircraft altitude.

1           18.     The method of claim 14 wherein said step of outputting an alert signal  
2 comprises outputting an audio control signal to generate an aural alert.

1           19.     The method of claim 14 further comprising the step of outputting a  
2 video control signal to control representation of terrain in a first color for terrain located more  
3 than a predefined amount relative to current altitude of the aircraft and in a second color for  
4 terrain located less than said predefined amount relative to said current altitude wherein said  
5 predefined amount is a first value for a cruise phase of flight, a second value for an approach  
6 phase of flight, and a third value for a landing phase of flight.

1           20.     A computer program product for alerting a pilot of a rotary wing  
2 aircraft of proximity to terrain comprising:

3                 a computer readable storage medium having computer readable program code  
4 means embodied in said medium, said computer readable program code means comprising:

5                 a first computer instruction means for accessing a database of terrain  
6 information;

7                 a second computer instruction means for accessing signals representative of a  
8 position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft;

9                 a third computer instruction means for defining a look ahead distance;

10                a fourth computer instruction means for defining a first alert envelope,  
11 indicative of a first severity of terrain threat, wherein boundaries of said first alert envelope  
12 are determined as a first function of the flight path angle, said look ahead distance, and a  
13 terrain floor boundary;

14                a fifth computer instruction means for defining a second alert envelope,  
15 indicative of a second severity of terrain threat, wherein boundaries of said second alert  
16 envelope are determined as a second function of the flight path angle, said look ahead  
17 distance and said terrain floor boundary;

18                a sixth computer instruction means for defining said terrain floor boundary as  
19 a function of an aircraft altitude and a said speed; and

20                a seventh computer instruction means for outputting an alert signal when a  
21 subset of the stored terrain information is located within the boundaries of at least one of said  
22 first and said second alert envelopes.

1           21.     The computer program product of claim 20 further comprising an  
2 eighth computer instruction means for outputting a video control signal to control display of  
3 terrain on a display device.

1           22.     The computer program product of claim 20 further comprising an  
2 eighth computer instruction means for defining a cut-off envelope to form a boundary of at  
3 least one of said first and second alert envelopes.

1           23.     The computer program product of claim 20 further comprising an  
2 eighth computer instruction means for accessing a first and a second altitude signal from a  
3 distinct first and second sources respectively to obtain a compound altitude signal  
4 representative of the aircraft altitude.

1           24.     The computer program product of claim 20 wherein said seventh  
2 computer instruction means further comprises a means for outputting an audio control signal  
3 to generate an aural alert.

1           25.     The computer program product of claim 20 further comprising an  
2 eighth computer instruction means for outputting a video control signal to control  
3 representation of terrain in a first color for terrain located more than a predefined amount  
4 relative to a current altitude of the aircraft and in a second color for terrain located less than  
5 said predefined amount relative to said current altitude wherein said predefined amount is a  
6 first value for a cruise phase of flight, a second value for an approach phase of flight, and a  
7 third value for a landing phase of flight.

1           26.     An apparatus for alerting a pilot of a hover-capable aircraft of  
2 proximity to terrain, the apparatus comprising:  
3           an input for receiving signals representative of a position of the aircraft, a  
4 flight path angle of the aircraft and a speed of the aircraft, and coupled to a database of stored  
5 terrain information;

6           an output;  
7           a signal processing device, coupled to said input, and coupled to said output,  
8 for:

9           (a) defining a look ahead distance as a function of a distance to transition from  
10 a first phase of flight to a hover phase of flight;

11           (b) defining a first alert envelope, indicative of a first severity of terrain threat,  
12 wherein boundaries of said first alert envelope are determined as a first function of the  
13 flight path angle, said look ahead distance, and a terrain floor boundary;

14 (c) defining a second alert envelope, indicative of a second severity of terrain  
15 threat, wherein boundaries of said second alert envelope are determined as a second  
16 function of the flight path angle, said look ahead distance and said terrain floor  
17 boundary; and

18 (d) outputting an alert signal when a subset of the stored terrain information is  
19 located within the boundaries of at least one of said first and said second alert  
20 envelopes.

1 27. The apparatus of claim 26 wherein at least one of said first and second  
2 alert envelopes is further bounded by a cut-off envelope.

1 28. The apparatus of claim 26 wherein said signals representative of the  
2 position of an aircraft include a first signal received from a satellite navigation system  
3 indicative of an aircraft altitude and a second signal representative of the aircraft altitude  
4 received from a source other than the satellite navigation system, and wherein said signal  
5 processing device further comprises a means for determining a compound altitude signal.

1 29. The apparatus of claim 26 wherein the boundaries of at least one of  
2 said first and second alert envelopes is further determined as a function of a configurable  
3 datum.

1 30. The apparatus of claim 26 wherein at least one of said first and second  
2 alert envelopes further comprises a subset of alert envelopes representing various severities of  
3 hazard to the aircraft.

1 31. The apparatus of claim 26 wherein said signal processing device  
2 comprises a microprocessor.

1 32. The apparatus of claim 26 wherein said signal processing device  
2 comprises a means for outputting said alert signal as a video control signal, wherein said  
3 video control signal is useful for controlling representation of terrain on a video display in  
4 various colors according to a degree of terrain threat.

1 33. The apparatus of claim 26 further comprising a voice warning  
2 generator coupled to said signal processor and wherein said alert signal output from said

3 signal processing device comprises an audio control signal to command said voice warning  
4 generator to output an aural alert.

1 34. The apparatus of claim 26 wherein said speed comprises a  
2 groundspeed of the aircraft.

1 35. The apparatus of claim 26 wherein the aircraft is an airship.

1 36. The apparatus of claim 26 wherein the aircraft is a tilt rotor.

1 37. The apparatus of claim 26 wherein said signal processing device  
2 further comprises a means for outputting a video control signal to control representation of a  
3 background terrain data proximate the aircraft:

4 in a first color for terrain located more than a predetermined amount relative to  
5 a current altitude of the aircraft wherein said predetermined amount is a first value for a  
6 cruise phase of flight and a second value for an approach phase of flight and a third value for  
7 a landing phase of flight; and

8 in a second color for terrain located less than said predetermined amount  
9 relative to said current altitude.

1 38. The apparatus of claim 26 wherein said cruise, approach and landing  
2 phases are defined as a function of said speed of the aircraft.

1 39. A method for alerting a pilot of a hover-capable aircraft of proximity to  
2 terrain comprising the steps of:

3 accessing a database of terrain information;

4 receiving signals representative of a position of the aircraft, a flight path angle  
5 of the aircraft and a speed of the aircraft;

6 defining a look ahead distance as a function of a distance to transition from a  
7 first phase of flight to a hover phase of flight;

8 defining a first alert envelope, indicative of a first severity of terrain threat,  
9 wherein boundaries of said first alert envelope are determined as a first function of the flight  
10 path angle, said look ahead distance, and a terrain floor boundary;

11 defining a second alert envelope, indicative of a second severity of terrain  
12 threat, wherein boundaries of said second alert envelope are determined as a second function  
13 of the flight path angle, said look ahead distance and said terrain floor boundary; and

14           outputting an alert signal when a subset of the stored terrain information is  
15   located within the boundaries of at least one of said first and said second alert envelopes.

1           40.     The method of claim 39 wherein said step of outputting an alert signal  
2   further comprises the step of outputting a video control signal to control display of terrain on  
3   a display device.

1           41.     The method of claim 39 further comprising the step of defining a cut-  
2   off envelope to form a boundary of at least one of said first and second alert envelopes.

1           42.     The method of claim 39 further comprising the step of receiving a first  
2   and a second altitude signal from a distinct first and second sources respectively to obtain a  
3   compound altitude signal representative of the aircraft altitude.

1           43.     The method of claim 39 wherein said step of outputting an alert signal  
2   comprises outputting an audio control signal to generate an aural alert.

1           44.     The method of claim 39 further comprising the step of outputting a  
2   video control signal to control representation of terrain in a first color for terrain located more  
3   than a predefined amount relative to a current altitude of the aircraft and in a second color for  
4   terrain located less than said predefined amount relative to said current altitude wherein said  
5   predefined amount is a first value for a cruise phase of flight, a second value for an approach  
6   phase of flight, and a third value for a landing phase of flight.

1           45.     A computer program product for alerting a pilot of a hover-capable  
2   aircraft of proximity to terrain comprising:

3           a computer readable storage medium having computer readable program code  
4   means embodied in said medium, said computer readable program code means comprising:

5           a first computer instruction means for accessing a database of terrain  
6   information;

7           a second computer instruction means for accessing signals representative of a  
8   position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft;

9           a third computer instruction means for defining a look ahead distance as a  
10   function of a distance to transition from a first phase of flight to a hover phase of flight;

11          a fourth computer instruction means for defining a first alert envelope,  
12   indicative of a first severity of terrain threat, wherein boundaries of said first alert envelope



13 are determined as a first function of the flight path angle, said look ahead distance, and a  
14 terrain floor boundary;

15 a fifth computer instruction means for defining a second alert envelope,  
16 indicative of a second severity of terrain threat, wherein boundaries of said second alert  
17 envelope are determined as a second function of the flight path angle, said look ahead  
18 distance and said terrain floor boundary; and

19 a sixth computer instruction means for outputting an alert signal when a subset  
20 of the stored terrain information is located within the boundaries of at least one of said first  
21 and said second alert envelopes.

1 46. The computer program product of claim 45 further comprising a  
2 seventh computer instruction means for outputting a video control signal to control display of  
3 terrain on a display device.

1 47. The computer program product of claim 45 further comprising a  
2 seventh computer instruction means for defining a cut-off envelope to form a boundary of at  
3 least one of said first and second alert envelopes.

1 48. The computer program product of claim 45 further comprising a  
2 seventh computer instruction means for accessing a first and a second altitude signal from a  
3 distinct first and second sources respectively to obtain a compound altitude signal  
4 representative of the aircraft altitude.

1 49. The computer program product of claim 45 wherein said sixth  
2 computer instruction means further comprises a means for outputting an audio control signal  
3 to generate an aural alert.

1 50. The computer program product of claim 45 further comprising a  
2 seventh computer instruction means for outputting a video control signal to control  
3 representation of terrain in a first color for terrain located more than a predefined amount  
4 relative to a current altitude of the aircraft and in a second color for terrain located less than  
5 said predefined amount relative to said current altitude wherein said predefined amount is a  
6 first value for a cruise phase of flight, a second value for an approach phase of flight, and a  
7 third value for a landing phase of flight.

1                   51.     An apparatus for alerting a pilot of a rotary wing aircraft of proximity  
2 to terrain comprising:  
3                   an input for receiving signals representative of a position of the  
4 aircraft, a flight path angle of the aircraft and a speed of the aircraft, and coupled to a  
5 database of stored terrain information;  
6                   an output; and  
7                   a signal processor, coupled to said input and to said output for:  
8                   (a) defining a look ahead/look down alert envelope, wherein  
9 boundaries of said alert envelope are determined as a function of the flight path angle,  
10 a look ahead distance, and a terrain floor boundary; wherein said terrain floor  
11 boundary comprises a function of an aircraft altitude and said speed, and wherein said  
12 look ahead distance comprises a function of a distance to transition from a first phase  
13 of flight to a hover phase of flight; and  
14                   (b) outputting an alert signal when a subset of the stored terrain  
15 information is located within the boundaries of said alert envelope.

1                   52.     The apparatus of claim 51 wherein said look ahead/look down alert  
2 envelope further comprises a first, caution, envelope and a second, warning, envelope.

1                   53.     The apparatus of claim 52 wherein said signal processor outputs a first  
2 alert signal when said subset of the stored terrain information is located within the boundaries  
3 of said caution envelope and a second alert signal when said subset of the stored terrain  
4 information is located within the boundaries of said warning envelope.

1                   54.     The apparatus of claim 51 wherein said signal processor comprises a  
2 microprocessor.

1                   55.     The apparatus of claim 51 wherein said speed comprises a  
2 groundspeed of the aircraft.

1                   56.     The apparatus of claim 51 wherein said signal processing device  
2 comprises a means for outputting said alert signal as a video control signal, wherein said  
3 video control signal is useful for controlling representation of terrain on a video display in  
4 various colors according to a degree of terrain threat.

1           57.     The apparatus of claim 51 further comprising a voice warning  
2 generator coupled to said signal processor and wherein said alert signal output from said  
3 signal processing device comprises an audio control signal to command said voice warning  
4 generator to output an aural alert.

1           58.     The apparatus of claim 51 wherein said signal processing device  
2 further comprises a means for outputting a video control signal to control representation of a  
3 background terrain data proximate the aircraft:

4                 in a first color for terrain located more than a predetermined amount relative to  
5 a current altitude of the aircraft wherein said predetermined amount is a first value for a  
6 cruise phase of flight and a second value for an approach phase of flight and a third value for  
7 a landing phase of flight; and

8                 in a second color for terrain located less than said predetermined amount  
9 relative to said current altitude.

1           59.     The apparatus of claim 58 wherein said cruise, approach and landing  
2 phases are defined as a function of said speed of the aircraft.

1           60.     The apparatus of claim 51 wherein said signal processor further defines  
2 a look up envelope and outputs said alert signal when said subset of terrain is located within  
3 said look up envelope.

1           61.     A method for alerting a pilot of a rotary wing aircraft of proximity to  
2 terrain comprising the steps of:

3                 receiving signals representative of a position of the aircraft, a flight path angle  
4 of the aircraft and a speed of the aircraft, and stored terrain information;

5                 defining a look ahead/look down alert envelope, wherein boundaries of said  
6 alert envelope are determined as a function of the flight path angle, a look ahead distance, and  
7 a terrain floor boundary; wherein said terrain floor boundary comprises a function of an  
8 aircraft altitude and a said speed, and wherein said look ahead distance comprises a function  
9 of a distance to transition from a first phase of flight to a hover phase of flight; and

10                outputting an alert signal when a subset of the stored terrain information is  
11 located within said alert envelope.

1           62.     The method of claim 61 wherein said look ahead/look down alert  
2 envelope further comprises a first caution envelope and a second warning envelope.

1           63.     The method of claim 62 further comprising the steps of outputting a  
2 first alert signal when said subset of the stored terrain information is located within the  
3 boundaries of said caution envelope and outputting a second alert signal when said subset of  
4 the stored terrain information is located within the boundaries of said warning envelope.

1           64.     The method of claim 61 further comprising the step of outputting a  
2 video control signal, wherein said video control signal is useful for controlling representation  
3 of terrain on a video display in various colors according to a degree of terrain threat.

1           65.     The method of claim 61 further comprising the step of outputting an  
2 aural alert.

1           66.     The method of claim 61 further comprising the step of outputting a  
2 video control signal to control representation on a display of a background terrain data  
3 proximate the aircraft:

4                 in a first color for terrain located more than a predetermined amount relative to  
5 a current altitude of the aircraft wherein said predetermined amount is a first value for a  
6 cruise phase of flight and a second value for an approach phase of flight and a third value for  
7 a landing phase of flight; and

8                 in a second color for terrain located less than said predetermined amount  
9 relative to said current altitude.

1           67.     The method of claim 66 further comprising the step of defining said  
2 cruise, approach and landing phases as a function of said speed of the aircraft.

1           68.     The method of claim 61 further comprising the step of defining a look  
2 up envelope and outputting said alert signal when said subset of terrain is located within said  
3 look up envelope.

1           69.     A computer program product for alerting a pilot of a rotary wing  
2 aircraft of proximity to terrain comprising:  
3                 a computer readable storage medium having computer readable program code  
4 means embodied in said medium, said computer readable program code means comprising:

5 a first computer instruction means for accessing signals representative of a  
6 position of the aircraft, a flight path angle of the aircraft and a speed of the aircraft, and stored  
7 terrain information;

8 a second computer instruction means for defining a look ahead/look down  
9 alert envelope, wherein boundaries of said alert envelope are determined as a function of the  
10 flight path angle, a look ahead distance, and a terrain floor boundary; wherein said terrain  
11 floor boundary comprises a function of an aircraft altitude and said speed, and wherein said  
12 look ahead distance comprises a function of a distance to transition from a first phase of flight  
13 to a hover phase of flight; and

14 a third computer instruction means for outputting an alert signal when a subset  
15 of the stored terrain information is located within said alert envelope.

1 70. The computer program product of claim 69 wherein said second  
2 computer instruction means further defines said look ahead/look down alert envelope as  
3 comprising a first caution envelope and a second warning envelope.

1 71. The computer program product of claim 70 further comprising a fourth  
2 computer instruction means for outputting a first alert signal when said subset of the stored  
3 terrain information is located within the boundaries of said caution envelope and outputting a  
4 second alert signal when said subset of the stored terrain information is located within the  
5 boundaries of said warning envelope.

1 72. The computer program product of claim 69 further comprising a fourth  
2 computer instruction means for outputting a video control signal, wherein said video control  
3 signal is useful for controlling representation of terrain on a video display in various colors  
4 according to a degree of terrain threat.

1 73. The computer program product of claim 69 further comprising a fourth  
2 computer instruction means for outputting an aural alert.

1 74. The computer program product of claim 69 further comprising a fourth  
2 computer instruction means for outputting a video control signal to control representation on  
3 a display of a background terrain data proximate the aircraft:

4 in a first color for terrain located more than a predetermined amount relative to  
5 a current altitude of the aircraft wherein said predetermined amount is a first value for a

6 cruise phase of flight and a second value for an approach phase of flight and a third value for  
7 a landing phase of flight; and  
8 in a second color for terrain located less than said predetermined amount  
9 relative to said current altitude.

1 75. The computer program product of claim 74 further comprising a fifth  
2 computer instruction means for defining said cruise, approach and landing phases as a  
3 function of said speed of the aircraft.

1 76. The computer program product of claim 69 further comprising a fourth  
2 computer instruction means for defining a look up envelope and wherein said third computer  
3 instruction means outputs said alert signal when said subset of terrain is located within said  
4 look up envelope.

1 77. A ground proximity warning system for rotary wing aircraft  
2 comprising:

3 a warning computer including:

4 (a) an input for receiving signals representative of a position of the aircraft, a  
5 flight path angle of the aircraft and a speed of the aircraft, and coupled to a database  
6 of stored terrain information;

7 (b) an output; and

8 (c) a signal processor, coupled to said input and to said output for:

9 (i) defining an alert envelope, wherein boundaries of said alert envelope  
10 are determined as a function of the flight path angle, a look ahead distance,  
11 and a terrain floor boundary; wherein said terrain floor boundary comprises a  
12 function of an aircraft altitude and said speed, and wherein said look ahead  
13 distance comprises a function of a distance to transition from a first phase of  
14 flight to a hover phase of flight; and

15 (ii) outputting an alert signal when a subset of the stored terrain  
16 information is located within the boundaries of said alert envelope; and  
17 a display, having an display input coupled to said output of said warning  
18 computer, for displaying said terrain data proximate the aircraft in various colors  
19 according to a degree of terrain threat.

1           78.     The system of claim 77 wherein said warning computer comprises a  
2 general purpose processor.

1           79.     The system of claim 77 wherein said speed comprises a groundspeed  
2 of the aircraft.

1           80.     The system of claim 77 wherein the aircraft is a tilt rotor.

1           81.     A ground proximity warning system for rotary wing aircraft  
2 comprising:

3                 a warning computer including:

4                 (a) an input for receiving signals representative of a position of the aircraft, a  
5 flight path angle of the aircraft and a speed of the aircraft, and coupled to a database  
6 of stored terrain information;

7                 (b) an output; and

8                 (c) a signal processor, coupled to said input and to said output for:

9                     (i) defining an alert envelope, wherein boundaries of said alert envelope  
10                     are determined as a function of the flight path angle, a look ahead distance,  
11                     and a terrain floor boundary; wherein said terrain floor boundary comprises a  
12                     function of an aircraft altitude and said speed, and wherein said look ahead  
13                     distance comprises a function of a distance to transition from a first phase of  
14                     flight to a hover phase of flight; and

15                     (ii) outputting an alert signal when a subset of the stored terrain  
16                     information is located within the boundaries of said alert envelope; and  
17                     a display, having an display input coupled to said output of said warning  
18 computer, for:

19                 (a) displaying said terrain data located in the boundaries of said alert envelope  
20 in various colors according to a degree of terrain threat; and

21                 (b) displaying terrain data proximate the aircraft:

22                     (i) in a first color for terrain located more than a predetermined amount  
23 relative to a current altitude of the aircraft wherein said predetermined amount  
24 is a first value for a cruise phase of flight and a second value for an approach  
25 phase of flight and a third value for a landing phase of flight; and

26 (ii) in a second color for terrain located less than said predetermined  
27 amount relative to said current altitude.

1 82. The system of claim 77 wherein the aircraft is a tilt rotor.

1 83. The method of claim 14 wherein said speed comprises a groundspeed  
2 of the aircraft.

1 84. The computer program product of claim 20 wherein said speed  
2 comprises a groundspeed of the aircraft.

1 85. The method of claim 39 wherein said speed comprises a groundspeed  
2 of the aircraft.

1 86. The computer program product of claim 45 wherein said speed  
2 comprises a groundspeed of the aircraft.

1 87. The method of claim 61 wherein said speed comprises a groundspeed  
2 of the aircraft.

1 88. The computer program product of claim 69 wherein said speed  
2 comprises a groundspeed of the aircraft.

1 89. The method of claim 1 wherein said look ahead distance comprises a  
2 function of a distance to a nearest runway.